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REVISION OF THE NEARCTIC LEAFHOPPERS OF THE TRIBE ERRHOMENELLINI (HOMOPTERA: CICADELLIDAE)

By P. W. Oman

The studies here presented are based on material in the United States National Museum and on specimens lent for study by Dr. E. D. Ball, of the University of Arizona, Dr. R. H. Beamer, of the University of Kansas, and J. A. Gillett, of Twin Falls, Idaho. Since representatives of the tribe are usually not abundant in collections, these loans have aided materially in the preparation of a revisional paper.

According to the available distribution records, the North American representatives of the group are confined to the western part of the United States; however, it is probable that certain species occur in adjacent sections of Canada and Mexico as well. All the species appear to be confined to arid or semiarid regions. Little is known concerning food-plant associations, but *Errhomus* appears to be restricted to the *Artemisia* belt. *Pagaronia* and *Lystridea* occur in the coastal chaparral association, while *Friscanus friscanus* is apparently confined to *Lupinus arboreus*.

The tribe Errhomenellini has usually been considered to be somewhat intermediate in character between the subfamilies Cicadellinae and Jassinae. In this view I concur but believe that the tribe should be referred to the Jassinae rather than the Cicadellinae, where it was placed by Van Duzee in his Check List, 1916, and Catalogue, 1917. It is assigned to the Jassinae because the ocelli are usually near the

margins of the crown and because the hind wings of macropterous forms have four apical cells rather than three as in the Cicadellinae.

The Errhomenellini and the closely related Evacanthini may be distinguished from other Jassinae by the position of the ocelli, which are on the crown near the anterolateral margins, and the shape of the facial sclerites, especially the clypellus, which is unusually large, broad basally, narrowed distally, and extending beyond the genae. The apex of the clypellus is rounded, not truncate, and the entire face is usually rather broad. The Errhomenellini differ from the Evacanthini in that the clypeus is without a median carina.

According to my interpretation, the genera *Errhomenellus* Puton and *Bathysmatophorus* Sahlberg are not represented in North America. For the Nearctic species previously assigned to the former, two new genera have been erected, while the name *Lystridea* Baker is available for the species referred to the latter. A third new genus is described to accommodate an apparently new species from Idaho.

KEY TO THE GENERA OF ERRHOMENELLINI

1. Crown without numerous fine striae ..... Errhomus, new genus
   Crown with numerous fine, mostly longitudinal striae, at least basally 2
2. Head elongate and rather narrow; crown always well produced anteriorly. Species not especially robust 3
   Head short and broad; crown not greatly produced anteriorly, or if so, then species robust and brachypterous 4
3. Head subconical and pointed apically. Species macropterous .. Pagaronia Ball
   Head blunt apically. Species subbrachypterous ..... Friscanus, new genus
4. Head narrower than pronotum; posterior margin of pronotum incised ..... Thatuna, new genus
   Head as broad as or broader than pronotum; posterior margin of pronotum not incised ..... Lystridea Baker

Genus PAGARONIA Ball

Pagaronia Ball, Can. Ent., vol. 34, p. 19, 1902.

Relatively large leafhoppers, about 8–10 mm in length. Head, including eyes, distinctly narrower than pronotum; apex of head subconical and rather sharply pointed; face long and narrow, clypeus and clypellus large; crown irregularly convex, surface with numerous fine, irregular, longitudinal striae, posterior margin distinctly elevated above pronotum along its entire width and forming a distinct flange next each eye. Pronotum relatively short and broad; lateral margins carinate and diverging posteriorly; posterior margin shallowly incised medially. Fore and hind wings well developed and extending beyond tip of abdomen; central anteapical cell of fore wing usually open basally; appendix small or absent. Hind wing with four apical cells. Pecten of hind basitarsus consisting of six or seven setae of variable size, the first and last of the series spinelike.

Ovipositor sheath extending beyond tip of pygofer; female pygofer with numerous setae. Male valve hidden or very small; male plates more or less elongate; styles relatively small and curved downward distally; sternal apodemes absent.

Type of genus, *Pagaronia 13-punctata* Ball, 1902.

Three species in addition to the genotype are recognized as belonging to the genus. *Tettigonia tripunctata* Fitch, 1851 (New York State Cab., p. 55), which has been referred to *Pagaronia*, belongs in the subfamily Cicadellinae on the basis of the position of the ocelli and the venation of the hind wings, and for it the genus *Plesiommata* Provancher,[1] 1889 (p. 263), is available.

KEY TO THE SPECIES OF PAGARONIA

1. Black markings on head and thorax consisting of numerous irregular blotches (pl. 5, fig. 1)---------- triunata Ball
   Black markings on head and thorax consisting of small, definite spots (pl. 5, fig. 2), or absent---------- 2
2. Posterior margin of seventh sternite of female not notched medially. Terminal processes of aedeagus extending beyond shaft of aedeagus (pl. 5, fig. 2B)---------- furcata, new species
   Posterior margin of seventh sternite of female with a faint notch medially. Terminal processes of aedeagus extending laterad, and to some extend back along shaft of aedeagus (pl. 5, figs. 3A, 4A)---------- 3
3. Aedeagus and its terminal processes slender, the latter not serrate (pl. 5, fig. 3A)---------- confusa, new species
   Aedeagus and its terminal processes stout, the latter serrate on outer margins (pl. 5, fig. 4A)---------- 13-punctata Ball

PAGARONIA TRIUNATA Ball

PLATE 5, FIGURES 1, 1A

Pagaronia 13-punctata var. *triunata* BALL, Can. Ent., vol. 34, p. 20, 1902.

Easily distinguished from other species of the genus by the irregular black markings on the head and the long, slender male plates. Length 7.7–9.25 mm.

General ground color sordid yellowish white. Clypeus with 11 or 12 pairs of short, transverse, brown or fuscous lines laterally, and a small black spot just below the apex of the head medially. Anterior margin of head with a small black spot next each eye and a large, irregular black mark in front of each ocellus, each of these frequently divided to form two irregular blotches. Crown with black to fuscous marks as follows: A small spot medially anterior to ocelli, another next each eye, a pair of elongate spots on posterior

[1] S. E. Crumb has called my attention to the fact that certain copies of Provancher's "Petite Faune Entomologique du Canada," vol. 3, 1889, contain the description of *Plesiommata*, which is based on a single species, *biundulata*, described as new in the same publication. It is apparent that *Plesiommata biundulata* Provancher, 1889, is synonymous with *Tettigonia tripunctata* Fitch, 1851 (new synonymy).

margin, and a large, irregular blotch between each ocellus and the adjacent eye. Pronotum with irregular black to fuscous marks on anterior one-half, especially laterally. Scutellum with a pair of faint spots on disk and sometimes faint basal triangles. All the markings on the head and thorax are subject to considerable variation in size, shape, and intensity. Fore wings of female sordid subhyaline with faint reddish brown in cells; fore wings of male usually with cells distinctly red or reddish brown, veins pale. Hind wings smoky subhyaline. Abdomen usually with extensive fuscous markings.

Median length of crown slightly less than width of crown at anterior margin of eyes; median length of pronotum slightly greater than median length of crown. Posterior margin of seventh sternite of female slightly produced and with a faint notch medially. Male plates long, slender, and nearly parallel-sided; length over three times their combined basal width; tips bluntly pointed; distal two-thirds set with numerous setae.

Posterior margin of male pygofer with two pairs of slender, finger-like processes, the ventral pair extending dorsad and slightly caudad, the dorsal pair much shorter and directed caudad. Aedeagus stout; the portion carrying the ejaculatory duct extending first dorsad and then caudad; the apex obliquely truncate in lateral view, bifurcate in dorsal view.

Distribution.—Known only from California. In addition to the types, which are from Santa Clara County (Coquillett) and Santa Cruz Mountains (Koebele), there are examples at hand from Salinas (Ball), Alameda (Van Dyke), Honda (Oman), and specimens from the Uhler collection labeled "Congr.," which presumably means either Congress Junction or Congress Springs, both localities in Santa Clara County. The above localities indicate a rather limited distribution in the coastal hills near San Francisco.

PAGARONIA 13-PUNCTATA Ball

PLATE 5, FIGURES 4, 4A

Pagaronia 13-punctata BALL, Can. Ent., vol. 34, p. 20, 1902.

Pagaronia 13-punctata var. *octopunctata* KIRKALDY, Proc. Hawaiian Ent. Soc., vol. 2, p. 70, 1909 (new synonymy).

Color markings on head and pronotum consisting of a pattern of definite black spots. Length 8–9.5 mm.

General ground color pale green to pale yellow, with 13 black spots as follows: One on clypeus just below apex of head, a pair on margin of crown near apex, one on the median line anterior to the ocelli, one below and one behind each ocellus, a pair on posterior margin of crown, and three arranged in a transverse row on the disk of the pronotum. The three pronotal spots (especially the two lateral

ones), the median spot on the crown, and the spots below the ocelli may be inconspicuous or absent, but the remaining spots are nearly always distinct. Fore wings subhyaline, sometimes with the cells golden-yellow.

Head slightly more pointed than in *triunata*, otherwise similar. Posterior margin of seventh sternite slightly produced and shallowly notched medially. Male plates slender, nearly three times as long as basal width, together slightly troughlike, not so flat as in *triunata;* tips blunt; surface set with numerous setae.

Male pygofer without processes. Aedeagus stout, extending dorsad and slightly caudad, bearing near the tip a pair of tapered processes that extend first ventrad and then laterad.

Distribution.—Recorded only from California. The types are from Los Angeles County (Coquillett and Koebele), Pasadena (Fall), and Marin County (Fuchs). It is probable that the specimens from Marin County are not *13-punctata* but *confusa*. Kirkaldy's *octopunctata* from the Santa Barbara foothills appears to be based on an example of *13-punctata* that lacks the pronotal spots and the spots below the ocelli. This is a common variation and is not believed to be worthy of a name. Other localities represented in the material at hand are Lancaster (Uhler collection), Mint Canyon (Oman), and above Mint Canyon (Oman). Mint Canyon is between Saugus and Palmdale. The above records indicate a rather limited distribution in the low hills near Los Angeles.

PAGARONIA CONFUSA, new species

PLATE 5, FIGURES 3, 3A

Superficially identical with *13-punctata*, with which it has apparently been confused, but with the male plates broader and the lateral processes of the aedeagus not curved. Length 8–9.5 mm.

General color as in *13-punctata*. Spots below ocelli and lateral spots on pronotum usually absent. Cells of fore wings of males pale orange-yellow, of females pale yellow to pale sordid yellow.

Head slightly more pointed than in *13-punctata*. Seventh sternite of female as in *13-punctata*. Male plates relatively slender, but distinctly broadened near base and then tapering to bluntly rounded tips; surface set with numerous setae.

Pygofer without processes. Aedeagus long and slender, curved dorsad posteriorly; apex with a pair of slender, pointed processes which extend ventrad and laterad.

Type locality.—Mount Diablo, Calif.

Types.—U.S.N.M. no. 52220.

Remarks.—The entire type series, consisting of the holotype male, allotype female, and 13 male and 8 female paratypes, were taken by the writer and Mrs. Oman at the type locality, June 21, 1935.

Distribution.—In addition to the type series there are at hand specimens from San Rafael (Oman), Sausalito (Thompson), and Palo Alto (Baker), Calif., and Reno?, Nev. (Brown).

PAGARONIA FURCATA, new species

PLATE 5, FIGS. 2–2B

Superficially resembling *13-punctata* Ball but larger, more robust, and with much broader male plates. Length 8.75–10 mm.

General ground color pale green to greenish white. Black spots on head and pronotum as in *13-punctata* but frequently with an additional spot below each ocellus and a spot on the median line of the pronotum anteriorly. Fore wings with veins whitish subhyaline; cells orange in the males, pale yellow or pale sordid yellow in the females. Hind wings subhyaline.

Head pointed but not so distinctly so as in *13-punctata*. Posterior margin of seventh sternite of female slightly produced and unnotched. Male plates much broader basally than in *13-punctata*, broadened still more near base, and tapering to bluntly rounded tips, the posterior two-thirds set with numerous setae.

Male pygofer without processes. Aedeagus long and slender, the portion carrying ejaculatory duct curving dorsad posteriorly and ending in a pair of slender, pointed processes which extend on beyond tip of aedeagus.

Type locality.—Cold Springs, Sequoia National Forest, Calif.

Types.—U.S.N.M. no. 52221.

Remarks.—The type series consists of the holotype male, allotype female, and 11 male and 10 female paratypes taken at the type locality by the writer and Mrs. Oman, June 10, 1935.

FRISCANUS, new genus

Intermediate in character between *Pagaronia* Ball and *Errhomus*, new genus; differing from the former in having shorter wings and no spinelike setae in the pecten of the hind basitarsus, and from the latter in the character of the surface of the crown, which has numerous fine, longitudinal striae.

Head, including eyes, slightly narrower than pronotum; crown nearly flat, median length greater than length of pronotum. Pronotum rather short and broad; lateral margins carinate. Scutellum small. Fore wings subcoriaceous and rather short, not reaching to tip of abdomen, lacking appendices; venation variable. Hind wings short, reaching fifth or sixth abdominal segment. Pecten of hind basitarsus consisting of five setae of nearly uniform size, none of which are spinelike. Sexual dimorphism apparent.

Ovipositor sheath extending beyond tip of pygofer; female pygofer with numerous short setae. Male valve small, usually concealed; male plates slender and elongate; styles small, curved laterad and ventrad distally; male with two pairs of sternal apodemes, arising from the second and third abdominal segments.

Type of the genus, *Errhomenellus friscanus* Ball, 1909. No other species belonging to the genus are known.

FRISCANUS FRISCANUS (Ball)

PLATE 5, FIGURE 6

Errhomenellus friscanus BALL, Can. Ent., vol. 41, p. 182, 1909.
Memnonia simplex VAN DUZEE, Proc. California Acad. Sci., vol 7, p. 294, 1917 (new synonymy).

Rather robust leafhoppers without distinctive markings. Length of female 5.75–6 mm, of male 3.75–4.1 mm.

Female nearly uniformly pale green. Male pale green or powdery green, with fuscous to black markings as follows: A pair of stripes across crown and pronotum, converging and sometimes fused anteriorly, frequently reduced to two pairs of spots on the crown and two faint, irregular stripes on pronotum; basal triangles on scutellum, frequently entirely absent; areas on fore wing, particularly the clavus and apical and costal cells; portions of dorsum of abdomen and tips of plates; inner surface of fore tibia and distal tarsal segment of first two pairs of legs. Most of these markings are at times indistinct or absent.

Crown of female 1.6 times as long as pronotum, that of male 1.4 times as long as pronotum. Posterior margin of seventh sternite of female slightly produced and with a small notch medially. Male plates long and slender, curved upward posteriorly, tapering slightly to rounded tips.

Male pygofer with a pair of slender, pointed, fingerlike processes arising ventrally and extending dorsad and caudad along posterior margins of pygofer. Aedeagus simple, stout basally, terminal portion slender and pointed and directed dorsad. Both pairs of sternal apodemes heavily sclerotized and black, the first pair rather slender, the second pair broad.

Distribution.—Originally described from material collected at San Francisco, Calif. All specimens of the rather extensive collection at hand came either from San Francisco or from localities along the coast a short distance south of San Francisco. I have found nymphs and adults abundant on *Lupinus arboreus* in June.

ERRHOMUS, new genus

Related to *Errhomenellus* Puton, with which it has been confused, but differing from that genus as fixed by its type, *brachypterus*

Fieber, in having a shorter rostrum, the lateral margins of the genae not notched below the eyes, a shorter, broader face, and the crown usually without a distinct median carina.

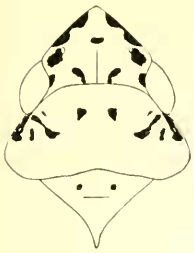
Crown as long as, or usually longer than, the pronotum; margin between crown and face either rounded or carinate. Pronotum short, posterior one-half usually faintly, transversely striate; lateral margins carinate; posterior margin shallowly incised. Males brachypterous, subbrachypterous, or macropterous; fore wings membranous or sometimes subcoriaceous; venation irregular, with outer anteapical cell usually absent or small and central anteapical cell usually open basally; appendix absent. Females brachypterous so far as known; fore wings usually subcoriaceous. Pecten of hind basitarsus usually composed of four to six setae in an uneven row. Sexual dimorphism apparent.

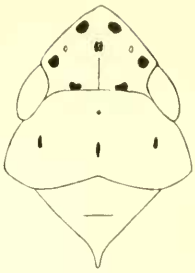
Ovipositor sheath extending beyond tip of pygofer. Male pygofer appressed. Male valve small; plates long and slender; styles long, slender, and curved upward distally; pygofer with a pair of hook-like processes next anal tube; sternal apodemes absent.

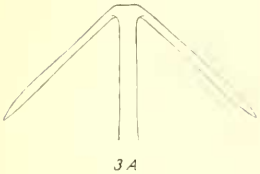
Type of the genus, *Errhomenus lineatus* Baker, 1898. The species assigned to the genus may be divided into two subgenera, as indicated by the following key:

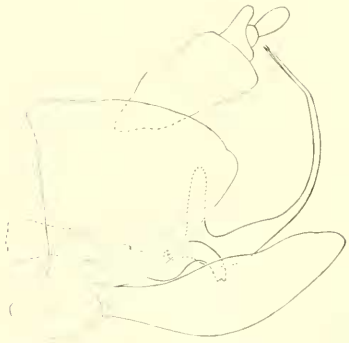
KEY TO THE SPECIES OF ERRHOMUS

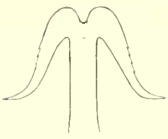
1. Anterior margin of crown not distinctly carinate. Clypeus distinctly swollen; suture between clypeus and lateral facial sclerites deeply impressed. (Subgenus *Errhomus*)..... 2
   Anterior margin of crown distinctly carinate. Clypeus not distinctly swollen; suture between clypeus and lateral facial sclerites not deeply impressed. (Subgenus *Carsonus*)..... 4
2. Eyes somewhat bulbous. Very robust species; males subbrachypterous..... oregonensis (Baker)
   Eyes not bulbous. Not unusually robust species; males macropterous so far as known..... 3
3. Posterior margin of seventh sternite of female produced and with a small median notch. Lateral processes of aedeagus rather stout and serrate on outer margins..... montanus (Baker)
   Posterior margin of seventh sternite of female broadly and rather shallowly incised. Lateral processes at tip of aedeagus slender and not serrate..... lineatus (Baker)
4. Anterior margin of head neither thin nor subfoliaceous; disk of crown convex..... irroratus (Ball)
   Anterior margin of head thin and subfoliaceous; disk of crown flat or concave..... 5
5. Crown of female only slightly produced medially, anterior margin rounded. Pygofer process of male as illustrated in plate 6, figure 9..... maculatus (Gillette and Baker)
   Crown of female distinctly produced and subangular. Pygofer process of male not as above..... aridus (Ball)





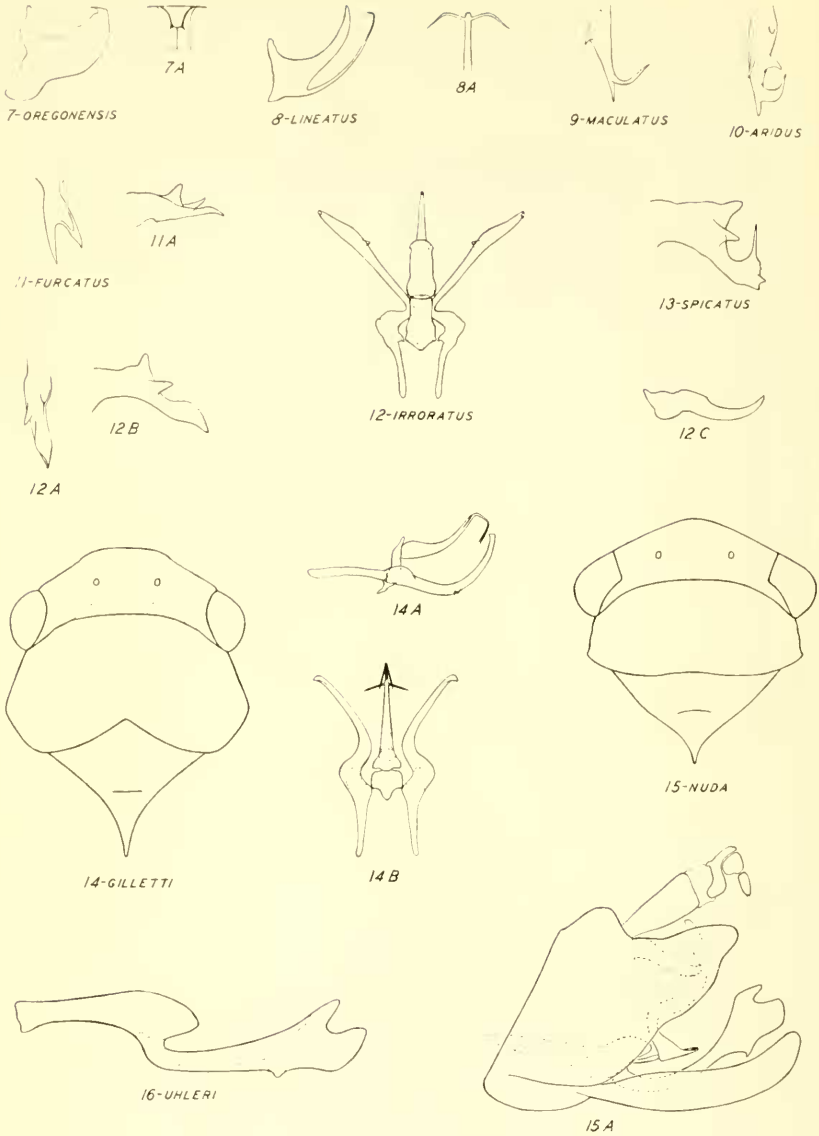






LEAFHOPPERS OF GENERA PAGARONIA, ERRHOMUS, AND FRISCANUS.

1, *Pagaronia triunata* Ball, head and thorax; 1A, lateral view of male genitalia; 2, *P. furcata*, new species, head and thorax; 2A, lateral view of male genitalia; 2B, caudodorsal view of tip of aedeagus; 3, *P. confusa*, new species, lateral view of male genitalia; 3A, caudal view of tip of aedeagus; 4, *P. 13-punctata* Ball, lateral view of male genitalia; 4A, dorsal view of tip of aedeagus; 5, *Errhomus montanus* (Baker), lateral view of genital capsule of male, showing pygofer process; 5A, dorsal view of tip of aedeagus; 6, *Friscanus friscanus* (Ball), lateral view of male genitalia.



LEAFHOPPERS OF GENERA ERRHOMUS, THATUNA, AND LYSTRIDEA.

7, *Errhomus oregonensis* (Baker), lateral view of aedeagus; 7A, dorsal view of apex of aedeagus; 8, *E. lineatus* (Baker), lateral view of aedeagus; 8A, caudal view of tip of aedeagus; 9, *E. maculatus* (Gillette and Baker), dorsal view of pygofer process of male; 10, *E. aridus* (Ball), dorsal view of pygofer process of male; 11, *E. aridus furcatus*, new subspecies, dorsal view of pygofer process of male; 11A, lateral view of same; 12, *E. irroratus* (Ball), dorsal view of styles, connective, and aedeagus; 12A, dorsal view of male pygofer process; 12B, lateral view of same; 12C, lateral view of aedeagus; 13, *E. irroratus spicatus*, new subspecies, lateral view of pygofer process of male; 14, *Thatuna gilletti*, new species, head and thorax; 14A, lateral view of styles, connective, and aedeagus; 14B, dorsal view of same; 15, *Lystridea nuda*, new species, head and thorax; 15A, lateral view of male genitalia; 16, *L. uhleri* (Baker), lateral view of style.

ERRHOMUS (ERRHOMUS) OREGONENSIS (Baker)

PLATE 6, FIGURES 7, 7A

Errhomenus oregonensis BAKER, Psyche, vol. 8, p. 262, 1898.

Very robust, with the short, broad fore wings adding to the robust appearance. Length of female 7.5–9 mm, of male 5.25–5.75 mm.

Ground color sordid yellowish white. Clypeus marked with transverse bars of fuscous to black; crown with irregular fuscous to black marks near apex and next eyes, and a pair of black spots at base. Pronotum with a black area behind each eye and a transverse row of irregular black or fuscous markings. Fore wings with faint irregular brown to fuscous markings except for an area on disk; veins usually sordid white. Abdomen and legs variously marked with brown, fuscous, or black. All the markings of this species are extremely variable in intensity and size, and there are frequently irregular spots in addition to those mentioned.

Crown slightly longer than pronotum, slightly depressed laterad of each ocellus. Pronotum of nearly uniform length throughout its width. Fore wings rounded apically, extending to the fifth to eighth abdominal segment; veins prominent, venation irregular.

Posterior margin of seventh sternite of female faintly incised medially. Male plates rather slender, tapering slightly from base to bluntly pointed tips. Tips of plates bent upward and diverging slightly.

Pygofer process of male broad, subtruncate distally, with a very short, toothlike protuberance projecting ventrad from the caudal margin. Aedeagus stout; tip truncate, with two pairs of short, spinelike projections, two extending laterad and two cephalad. Tips of styles hooked upward.

Distribution.—Originally described from specimens collected in Oregon by Koebele and one female from Corvallis, Oreg., collected by A. B. Cordley. Of these, a male specimen bearing Baker's red determination label is considered to be the type. In addition to the Oregon specimens I have examined one female from Humboldt, Calif. (H. S. Barber), and males, females, and one nymph from Paradise Valley, Mount Ranier, Wash. (W. W. Baker).

ERRHOMUS (ERRHOMUS) MONTANUS (Baker)

PLATE 5, FIGURES 5, 5A

Errhomenus montanus BAKER, Psyche, vol. 8, p. 262, 1898.

Less robust than *oregonensis*, head subangular rather than bluntly rounded. Males macropterous. Length of female 7.25–7.75 mm, of male 5.5–6 mm.

Females pale sordid yellow mottled and marked with brown to fuscous. Males similarly colored, but usually with more extensive fuscous markings, sometimes almost wholly fuscous except for veins of fore wings, which are either unmarked or irregularly marked with fuscous.

Anterolateral margins of crown nearly straight. Crown of female about one and one-half times as long as pronotum, that of male only slightly longer than pronotum. Venation of fore wing of male irregular; outer anteapical cell absent, central anteapical cell open basally, inner anteapical cell either open or closed basally; costal area with a few irregular veins from radius to costal margin in region of anteapical cells. Fore wing of female obliquely subtruncate, reaching to third abdominal segment.

Seventh sternite of female long, posterior margin produced and with a faint median notch. Male plates slender, diverging apically, slightly narrowed between base and middle.

Pygofer processes of male rather slender and sharply pointed distally. Aedeagus rather slender, bearing at the tip a pair of sinuately curved processes, which extend down along the shaft of the aedeagus and are coarsely and irregularly serrate on the outer margins. Styles slender, pointed distally.

Distribution.—Originally described from seven specimens from northern Colorado, the specific localities mentioned being Fort Collins and Cameron Pass. One of these, a male from Rabbit Ears Pass, bears Baker's determination label and is considered to be the type. In addition to the type series, I have examined specimens from Little Beaver, Colo. (Ball), Soldier Creek, Utah (Knowlton), and Fish Lake Mountain near Richfield, Utah (no collector).

ERRHOMUS (ERRHOMUS) LINEATUS (Baker)

PLATE 6, FIGURES 8, 8A

Errhomenus lineatus BAKER, Psyche, vol. 8, p. 261, 1898.

Superficially identical with *montanus* but with head slightly shorter and blunter and the processes of the aedeagus not serrate. Males macropterous. Length of female 7.25–8 mm, of male 6–7 mm.

Color as in *montanus* but with less mottling and more distinct spots. Structure about as in *montanus* except as noted. Seventh sternite of female with posterior margin very shallowly incised. Male plates as in *montanus*.

Pygofer processes of male similar to those of *montanus* but not so sharply pointed. Distal portion of aedeagus composed of two parts, a stout, curved dorsal portion without terminal processes, and a slender, curved, ventral portion which carries the ejaculatory duct and terminates in a pair of slender, fingerlike processes.

Distribution.—The original description was based on specimens of both sexes from Pullman, Wash. (C. V. Piper). One of the females, which bears Baker's red label, is considered the type. I have also examined specimens from the following localities in Washington: Yakima (A. R. Rolfs), Ritzville (M. C. Lane), north of Dryden (A. L. Melander), Ellensburg (W. W. Baker); and Moscow, Idaho (J. Gillett).

Carsonus, new subgenus

Differing from typical *Errhomus* as indicated in the key, and in addition having the hooklike processes of the male pygofer heavily sclerotized and bearing sharp spines or serrations, or both. In the subgenus *Errhomus* the hooklike processes of the male pygofer are of the same texture as the pygofer, and are bent ventrad posteriorly. In *Carsonus* the style has a sharp toothlike projection on the ventral surface about one-third the distance from the apex. Aedeagus of *Carsonus* as illustrated (pl. 6, figs. 12, 12C).

Type of the subgenus, *Acocephalus maculatus* Gillette and Baker, 1895.

Errhomus (Carsonus) irroratus (Ball)

Plate 6, Figures 12–12C

Errhomenellus irroratus Ball, Can. Ent., vol. 34, p. 18, 1902.

Rather robust; face strongly convex; crown of female distinctly longer than that of male. Length of female 5.5–6.5 mm, of brachypterous male 3.75–4 mm, of macropterous male 4.4–5 mm.

Female pale sordid yellow, heavily irrorate with fuscous and black; male fuscous to black, with numerous small circular yellow spots. Crown of female longer than pronotum, that of male equal to or shorter than pronotum. Fore wings of brachypterous specimens obliquely subtruncate, reaching to base of fourth abdominal segment. Fore wings of macropterous males with outer anteapical cell either present or absent, central and inner anteapical cells either open or closed basally.

Seventh sternite of female long; posterior margin notched medially and strongly sinuated between median notch and lateral angles. Male plates slender, of nearly uniform width; tips blunt.

Pygofer process of male with two toothlike projections, distal portion rounded and finely serrate on dorsal margin. Style broadened before apex and with a hook on ventral surface; tip pointed and recurved. Aedeagus rather stout basally, tapering distally and slightly curved.

Distribution.—Originally described from two females from Siskiyou County, Calif. (Koebele). The description of the male is based

upon a specimen collected near Bray, Calif. (Siskiyou County), June 29, 1935 (Oman). I have examined a long series of specimens including adults of both sexes and one nymph from Bray (Beamer and Oman); females from Weed, Calif. (Ball); near Bend, Oreg. (Beamer and Oman); Cliffdell, Wash. (Oman); Naches, Wash. (Beamer); and males and females from Craig, Colo. (Beamer).

ERRHOMUS (CARSONUS) IRRORATUS SPICATUS, new subspecies

PLATE 6, FIGURE 13

Externally identical with typical *irroratus* but with the pygofer process of the male with an erect, spinelike extension of the dorsal margin distally.

Type locality.—Criterion Pass, Oreg.

Types.—U.S.N.M. no. 52222.

Remarks.—Described from two macropterous males, the holotype collected July 2, 1935, by the writer, paratype from Tampico, Wash., May 16, 1932, A. R. Rolfs.

The true significance of the differences found in the pygofer processes of the males and the heads of the females belonging to this subgenus is not clear, and the problem is made more difficult by the rather infrequent association of specimens of the two sexes in material collected at a single locality. Because *aridus* Ball shows considerable uniformity of structure in material from several localities, I have decided to call attention to certain other segregates by describing them as subspecies of *irroratus* or *aridus*.

ERRHOMUS (CARSONUS) MACULATUS (Gillette and Baker)

PLATE 6, FIGURE 9

Acocephalus maculatus GILLETTE and BAKER, Colorado Agr. Expt. Stat. Bull. 31, p. 83, 1895.

Resembling *irroratus* but with crown flat or concave and posterior margin of seventh sternite of female less deeply incised. Length of female 6–6.5 mm, of brachypterous male 4–4.25 mm, of macropterous male 4.75 mm.

Color as in *irroratus* but usually not so dark. Crown rather short, not subangular at apex. Fore wings of brachypterous specimens reaching fourth abdominal segment; macropterous males usually with three anteapical cells in fore wing.

Seventh sternite of female large; notches and sinuations in posterior margin not so pronounced as in *irroratus*. Male plates about as in *irroratus*.

Pygofer process of male ending in one straight spine and one slender spine which curves mesad. Styles and aedeagus as in *irroratus*.

Distribution.—In addition to three specimens from Colorado (Baker collection), I have examined two females from Soldier, Utah (Ball), and a male from Ephraim, Utah (Ball).

Remarks.—According to the statement accompanying the original description of *maculatus*, it was described from two female specimens, but after a careful study of the description and illustrations, together with a male specimen labeled "type," I have concluded that the type specimens were actually males. The specimen labeled "type" fits exactly the illustrations of the head and genitalia, and the length is nearly as indicated. What is described and illustrated by Gillette and Baker as the last ventral segment of the female is actually the shallowly incised and strongly appressed eighth sternite of the male. Moreover, the plates of this male bear a strong resemblance to the ovipositor sheath of a teneral female.

ERRHOMUS (CARSONUS) ARIDUS (Ball)

PLATE 6, FIGURE 10

Errhomenellus aridus BALL, Can. Ent., vol. 41, p. 183, 1909.

Closely related to *maculatus*, but with the apex of the crown subangular and the posterior lateral angles of the seventh sternite of the female more produced. Length of female 6–6.5 mm, of brachypterous male 4 mm, of macropterous male 4.5 mm.

Pale sordid yellow, with irregular spots and maculations of brown and fuscous. Usually with fewer dark markings than either *irroratus* or *maculatus*.

Macropterous male usually with three closed anteapical cells in fore wing. Seventh sternite of female long, posterior margin much produced laterally, incised medially, and either incised or strongly sinuated between median notch and lateral angles. Male plates as in *irroratus*.

Pygofer process of male with two curved, hooklike projections extending mesad. Styles and aedeagus as in *irroratus*.

Distribution.—Originally described from four males from Reno, Nev. The description of the female is based upon a specimen from the type locality, April 30, 1908, E. D. Ball. Examples of *aridus* are at hand from Reno, Nev. (Ball); "Nevada" (Uhler collection); Kanab, Utah (Ball); Craig, Colo. (Beamer); Durango, Colo. (Oman); Naches, Wash. (Beamer); and Cliffdell, Wash. (Oman).

ERRHOMUS (CARSONUS) ARIDUS FURCATUS, new subspecies

PLATE 6, FIGURES 11, 11A

Externally identical with typical *aridus* but with the pygofer process of the male bifurcate posteriorly in dorsal view, the two forks

rather short and pointed. In the type a dorsal toothlike projection is much more prominent than in either of the two paratypes, which may represent a still different segregate.

Type locality.—Easton, Wash.

Type and paratype.—U.S.N.M. no. 52223.

Paratype.—University of Kansas collection.

Remarks.—Described from three macropterous males; the holotype collected by A. Koebele (no date), one paratype from Wenatchee Mountains, Wash., July 9, 1930, F. P. Dean, and one paratype from Mount Rainier, Wash., July 6, 1935, R. H. Beamer.

ERRHOMUS (CARSONUS) ARIDUS INCERTUS, new subspecies

Slightly larger than typical *aridus;* length of female 6.75–7 mm. Compared with typical *aridus* the crown is shorter, the clypeus more convex, and the posterior lateral angles of the seventh sternite of the female are less produced.

Type locality.—Cajon Pass, Calif.

Types.—U.S.N.M. no. 52224.

Remarks.—Described from a series of 82 females (holotype and paratypes) collected at the type locality by the writer and Mrs. Oman, June 6, 1935.

Distribution.—In addition to the types, other female specimens are at hand from the following California localities: Warner Springs (Oman), Macdoel (Oman), Doyle (Ball), Chilcoot (Ball), and Dorris (Beamer).

THATUNA, new genus

Closely related to *Bathysmatophorus*[2] Sahlberg, with which it agrees in general habitus and in the structure of the head and pronotum, but differing from that genus in the venation of the fore wing, which has the outer anteapical cell small and triangular and the central anteapical cell usually open basally.

Large, rather elongate leafhoppers. Head, including eyes, narrower than pronotum; face rather short and sparsely pilose; clypeus greatly swollen, especially near base of clypellus; margin between face and crown blunt and indefinite; crown rather short, surface uneven and with a few irregular, mostly longitudinal striae. Ocelli small, eyes somewhat bulbous. Pronotum about one-half as long

[2] I am not familiar with *B. reuteri* Sahlberg, 1871 (Notiser ur sällskapets pro fauna et flora Fennica förhandlingar, vol. 12, p. 111), the type of *Bathysmatophorus*, and my concept of the genus is based upon a study of the original description and Fieber's illustrations on pl. 10 of Rev. et Mag. Zool., 1876.

as wide, lateral margins long and distinctly carinate, posterior margin shallowly incised, surface irregularly transversely striate on posterior one-half. Scutellum large. Fore wing of male long, extending well beyond tip of abdomen; venation irregular, second cross vein extending obliquely distad from media to cubitus, appendix nearly absent; texture subcoriaceous, surface sparsely pilose along veins. Costal area of hind wing much wider basally than near hamulus. Female unknown, probably brachypterous. Pecten of hind basitarsus composed of five or six setae, these not clearly differentiated from the numerous setae covering the lower surface of the tarsal segment.

Male valve very small; plates long and slender; styles exceedingly long; pygofer with a pair of hooklike processes next to anal tube; sternal apodemes absent.

Type of the genus, *Thatuna gilletti*, new species.

THATUNA GILLETTI, new species

PLATE 6, FIGURES 14–14B

Length of male 8.5 mm. Ground color sordid yellowish white, heavily mottled with fuscous to black. Fore wing with numerous sordid white spots, the largest of these being along coastal margin or apically on veins. Hind wing smoky subhyaline.

Male plates turned upward distally, apices slightly diverging. Styles extending beyond plates, curved upward posteriorly, each with a small toothlike process on outer ventral surface at about the middle of posterior portion. Aedeagus broad basally, tapering distally, curved first caudad and dorsad, then bent abruptly ventrad at the distal end of the ejaculatory duct and bent again so that the terminal portion is directed ventrad and cephalad, bearing at the opening of the ejaculatory duct a pair of slender processes which extend laterad and slightly cephalad; distal portion forked. Hooklike processes of pygofer stout, pointed, and directed ventrad distally.

Type locality.—Moscow, Idaho.

Type and paratypes.—U.S.N.M. no. 52225.

Paratypes.—In collections of J. A. Gillett, E. D. Ball, and University of Kansas.

Remarks.—Described from a series of 10 male specimens as follows: Holotype and six paratypes from the type locality, May 31, 1931, J. Gillett; two paratypes from Cedar Mountain, Moscow, Idaho, June 24, 1920, M. C. Lane; and one paratype from Troy, Idaho, May 31, J. M. Aldrich.

I take pleasure in naming this unusual species for Joseph A. Gillett, who has collected many interesting leafhoppers in Idaho.

Genus LYSTRIDEA Baker[3]

Lystridea Baker, Psyche, vol. 8, p. 261, 1898.

Related to *Thatuna*, new genus, but with the head as wide as or wider than the pronotum, the clypeus less swollen, and the posterior margin of the pronotum not incised. Rather large, robust leafhoppers.

Head, including eyes, usually slightly wider than pronotum. Crown nearly flat, broad, and rather short; surface with numerous irregular striae behind ocelli. Ocelli small. Pronotum short and broad; lateral margins short and carinate; posterior margin very shallowly concave; surface transversely striate on posterior one-half. Males macropterous; wings membranous, venation variable but usually forming three anteapical cells, second cross vein between media and cubitus usually present and joining media at or anterior to base of central anteapical cell; appendix absent. Females brachypterous, fore wings subcoriaceous, venation variable and frequently obscure. Pecten of hind basitarsus consisting of six to eight setae of variable size, the first and last of the series usually spinelike. Sexual dimorphism apparent.

Ovipositor sheath extending well beyond tip of pygofer; female pygofer with only a few small setae. Male valve small, usually concealed; male plates long and slender; styles very long, compressed distally; sternal apodemes absent; pygofer with a pair of hooklike processes next anal tube.

Type of the genus, *Lystridea conspersa* Baker, 1898, which is a synonym of *Bathysmatophorus uhleri* Baker, 1898.

KEY TO THE SPECIES OF LYSTRIDEA

Distal portion of aedeagus with many stout setae. Species large ..... uhleri (Baker)
Distal portion of aedeagus without setae. Species smaller. Distribution, southern California ..... nuda, new species

LYSTRIDEA UHLERI (Baker)

Plate 6, Figure 16

Bathysmatophorus uhleri Baker, Psyche, vol. 8, p. 260, 1898.
Lystridea conspersa Baker, Psyche, vol. 8, p. 261, 1898.

A large species, the males rather elongate, the females robust. Length of female 8–10 mm, of male 7–9 mm. Width of head of female 2.75–3 mm, of male 2.5–2.75 mm.

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[3] Following his description of *Bathysmatophorus uhleri*, Baker, referring to his type specimens, states: "These specimens bore the Mss. name *Lystridea conspersa* Uhl." This association of the name *Lystridea conspersa* with the description of *B. uhleri* appears to satisfy the requirements of Article 25 of the International Rules of Zoological Nomenclature and validates the name as a synonym of *B. uhleri*. The specific name *conspersa* must remain a synonym of *uhleri*, but the generic name *Lystridea* is available for the species indicated.